

Sphere

Environment Systems Newsletter

Winter 2017

Welcome

As we approach the end of 2017 we can look back on not only another very successful year but also one which has brought home the importance of the work we do for our clients especially in relation to sustainability, food production and the effects of climate change. In this issue there is an update on our Data Services provision, another trip to the island of Montserrat, ecosystem services assessment in Norfolk, a successful planning application for a hydro-electric scheme in Wales and the launch of our new ethics policy. We wish you all a successful 2018 and look forward to catching up with you soon. editor@envsys.co.uk

Ethics Policy

Our vision is to be the leading supplier of evidence and insight. We aim to achieve this by becoming the leading research-led, environmental and agricultural information consultancy and services company. In this endeavour the company is guided by an ethics policy which is owned by its staff and is available to view and download on our website.

Why do we need an ethics policy? We are committed to ensuring that we conduct our business responsibly and with integrity. We want to be known as a company that can be trusted and to do what we say. The ethics policy is outlined below.

- We support the Universal Declaration of Human Rights
- Through the work we do, we actively support the Sustainable Development Goals (SDGs), a universal call to action

to end poverty, protect the planet and ensure that all people enjoy peace and prosperity. The SDGs work in the spirit of partnership and pragmatism to make the right choices now to improve life, in a sustainable way, for future generations.



- We care about our environment for the long term, and as a part of our external environmental audit we annually publish our company statistics for recycling, waste, energy and water consumption.
- We believe in innovation and the intelligent use of technology to enable us to better manage our environment

for the planet and improve food security.

- We generate a multitude of data which are then used by others and, wherever possible, we release data using an open licence. We wish for those data to be put to responsible use but we cannot - and will not - track all its uses. If you think data produced by Environment Systems is being used in ways which conflict with this policy, or you think what it is being used for is just wrong, please let us know and we will act.
- As a commercial company we believe in fair pricing with a fair profit to enable us to deliver value for money for our customers.
- As a commercial company we substantially reinvest profits to enhance delivery of our environmental and agricultural work which aids our customers long term aspirations to be more sustainable.

To contact us about our ethics policy, or report anything please get in touch: ethicalsustainability@envsys.co.uk

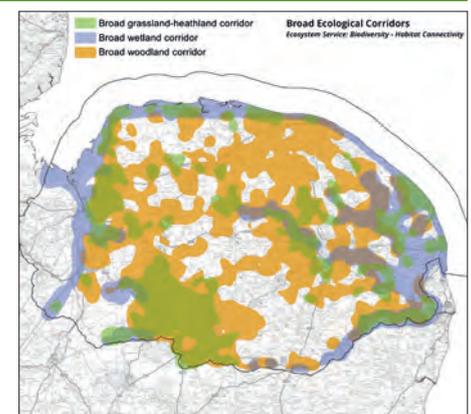
Mapping Resilient Ecological Networks for Green Infrastructure Policy

Green Infrastructure (GI) is a strategically planned and delivered network of semi-natural habitats and green spaces which deliver multiple benefits through ecological functions and processes. These are important for wildlife, habitats and mitigating the effects of climate change. GI is also important for the communities it serves with impacts upon health and wellbeing, economic growth, investment, land regeneration and sustainability. Its design and management should also respect and enhance the character and distinctiveness of an area with regard to habitats and landscape types.

Environment Systems was commissioned to use the 'Norfolk Living Map' to undertake a county wide ecological connectivity analysis to support future GI policy preparation and habitat restoration efforts. The project also included the modelling and mapping of opportunities for implementing Natural Flood Management (NFM) interventions. The project partners were Norfolk County Council, Norfolk Wildlife Trust, the Borough Council of King's Lynn & West Norfolk, Great Yarmouth

Borough Council, North Norfolk District Council, the Broads Authority, South Holland District Council, Breckland Council, Natural England and the Environment Agency.

A Habitat Asset Register (HAR) was created from the existing 'Norfolk Living Map' by categorising habitats into relevant ecosystem groups of woodland, grassland & heath and wetland. Within these groups we then calculated the extent of each habitat, and, using our SENCE Ecosystem Reference Database, attributed each habitat based on its ability to slow overland flow (e.g. by intercepting rainfall in the canopy, evapotranspiration and soil infiltration). Using our SENCE Basic methodology we mapped each resilient ecological network based on core habitat assets (patches) that provide source populations and smaller habitat assets, which provide functional connectivity for each network. The resulting maps were reviewed and analysed by the stakeholder group. Feedback was used to help create a rule-based approach for locating opportunity spaces for GI via the planning system and



Areas of native habitat that are joined together in a landscape are more resilient to changing climate or management

enhancements via approaches such as the Living Landscape Community Project.

The Natural Flood Management Map was created using the SENCE Map Algebra tool using the HAR in combination with terrain, soils, geology and land-use management data to identify the best places to slow water flow.

Ecosystem Assessment of the Island of Montserrat



Preliminary fieldwork on the island with gases from the Soufrière Hills volcano clearly visible on the horizon

In November we visited the island of Montserrat. Montserrat is a British Overseas Territory in the Leeward Islands, part of the Lesser Antilles island chain. The Island's capital, Plymouth, was devastated and abandoned after the eruption, in 1995, of the Soufrière Hills volcano.

Environment Systems has been commissioned by JNCC to carry out a National Ecosystem Assessment of Montserrat using its Earth Observation based mapping and Caribbean ecosystem expertise. Montserrat's ecosystems provide an important source of income through the exploitation of its unique biodiversity to promote tourism as well as supporting the livelihoods of Montserrat's population. Ecosystems provide multiple benefits such as the provision of fresh water, maintaining soil fertility and a variety of food resources.

During our 9 day visit to the island we participated in a workshop to scope the project and introduce the use of Earth Observation and GIS to interested parties, including those from the Montserrat Government and Montserrat National Trust, who will provide all Montserrat-based field work and support.

Our ongoing work will focus on a number of tasks:

- The generation of a complete terrestrial habitat map for Montserrat. The preliminary fieldwork for this was carried out during our November visit.
- Undertake a comparison of outputs of existing and in development habitat maps, spatial metrics and other supporting environmental data and produce a draft list of the most suitable datasets that are required for the project.
- Produce a set of Earth Observation based spatial metrics for ecosystem priorities and natural capital accounting.
- Provide recommendations for a future monitoring and reporting system based on Sentinel-1 and Sentinel-2.

Work is due for completion by the end of March 2018.

DATA SERVICES UPDATE



2016 Sentinel-2 optical composite image

In November we carried out a major upgrade to our Data Services portal. We have updated the landing page, changed some of the functionality in the back end but the major change is the addition of Sentinel-2 optical imagery. The Sentinel-2 optical products available are as follows:

- **True Colour Image/Red Green Blue (RGB)** - 'True colour' composite. Enables users to 'visualise' their Areas of Interest (AOI) and 'see' change for themselves.
- **Red Green Blue + NIR** (Sentinel-2 10m) - 'Science ready' product providing surface reflectance of 10m channels in wavelength order (i.e. Blue, Green, Red, NIR). Suitable for visualising, producing indices and classification.
- **Normalised Difference Vegetation Index (NDVI)** - Measure of vegetation productivity (measure of 'greenness').
- **Enhanced Vegetation Index (EVI)** - Similar to NDVI, EVI is used in areas of dense canopy where the large amounts of chlorophyll can affect NDVI. EVI helps to correct for soil background signals and atmospheric influences.
- **Optimised Soil Adjusted Vegetation Index (OSAVI)** - In areas where vegetation is sparse and soil is visible, OSAVI can be used to assess the

abundance and vigor of vegetation. It is similar to NDVI, however it compensates for the effects of soil reflectance.

- **Plant Senescence Reflectance Index (PSRI)** - An increase in PSRI indicates increased canopy stress, the onset of canopy senescence, and plant fruit ripening. Applications include vegetation health monitoring, plant physiological stress detection plus crop production and yield analysis.
- **Nitrogen Reflectance Index (NRI)** - Predicts plant nitrogen status. Can be used to estimate plant parameters and yield potential.
- **Modified Normalised Difference Water Index (MNDWI)** - Using MNDWI is one of the most popular methods for water body mapping. It overcomes the shortcomings of NDWI by using shortwave infrared to replace near infra-red used in NDWI. In the last few decades, it has been widely applied to produce water body maps at different scales.

Our existing Sentinel-1 products are as follows:

- **Backscatter** - A measure of the strength of the radar signal shows surface scattering; a rougher surface or urban areas with lots of right-angled structures generates higher VV backscatter. Surfaces such as forests generate higher VH backscatter than flat surfaces such as bare soil.
- **Backscatter with ratio band** The ratio band helps visualise the product in an RGB composite, providing a measure of vegetation density. The ratio correlates well with biomass similar to optical indices such as NDVI.

If you want to know more about interpreting our Sentinel-1 imagery we have produced a video -

https://www.youtube.com/watch?time_continue=4&v=DSpm9JHbSns

Ystradffyn Hydropower Project



Harnessing the power of the Afon Twyi has the potential to produce 9000MWh of clean renewable energy per year

Hydro Electric Development Ltd (HED Ltd) has won planning permission for a new hydropower development on the Afon Twyi in Carmarthenshire. By harnessing the power of the Afon Twyi approximately 1.6 km downstream of the Llyn Brienne Reservoir and dam, the project has the potential to produce 1.8 MW (9000 MWh a year) electricity. The electricity generated will be fed into the local National Grid network and will provide clean renewable energy to the mid-Wales region.

A study was undertaken to identify key issues associated with the proposed scheme to define the scope of the Environmental Statement (ES) and the parameters that would require further investigation as part of the planning process. Environment Systems' Ecology Services team provided the baseline ecological survey including Extended Phase 1 Habitat Survey, National Vegetation Classification (NVC), Lower plants survey, breeding bird surveys, otter and water vole surveys, badger survey, and bat surveys. The team also undertook the Ecological Impact Assessment (EclA) and prepared the Nature Conservation chapter of the Environmental Statement to support the wider Environmental Impact Assessment.

The construction phase of the project is expected to start in 2018.